QUALITY CONTROL REPORTS FOR

BITUMINOUS CONCRETE

CIVIL-TECH CONSULTANTS AND ENGINEERS

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Job No.: CTCE/BBMP/WNo.09/BHS/BC/Bitumen/2015-16 10.02.2015

TEST REPORT ON DETERMINATION OF BITUMEN CHARACTERISTICS

CLIENT	:	**Asst. Executive Engineer,** Vidyaranyapura Sub Division, BBMP, Bangalore.
AGENCY	:	**Mr. B.H. Shivakumar,** Contractor, Bangalore.
NAME OF WORK	:	Improvements of Nanjappa Circle in Ward No. 09, Vidyaranyapura Sub Division, BBMP, Bangalore.
REFERENCE	:	AEE/BBMP/VSD/PR/643/2014-15 Dated: 09.02.2015
SAMPLE ID	:	Bitumen
DATEOF TESTING	:	10.02.2015

The results of the tests conducted on the Bitumen sample are as follows:

Sl.No	Description	Technical Reference	Test Result	Requirement as per IS: 73-2013
1	Penetration at 25^{0}C, 100g, 5 Sec 1/10 mm	IS: 1203-1978 (RA-2009)	85	80 to 100
2	Softening point, ^{0}C	IS: 1205-1978 (RA-2009)	47	Min. 40
3	Ductility at 27^{0}C, cm	IS: 1208-1978 (RA-2009)	>100	Min. 75
4	Flash Point, ^{0}C	IS: 1209-1978 (RA-2009)	300	Min. 220

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Job No.: CTCE/BBMP/WNo.09/BHS/BC/AIV/2014-15 10.02.2015

Aggregate Impact Value

IS: 2386 Part IV

Client	**Asst. Executive Engineer,** Vidyaranyapura Sub Division, BBMP, Bangalore.
Agency	**Mr. B.H. Shivakumar,** Contractor, Bangalore.
Name of the Work	Improvements of Nanjappa Circle in Ward No. 09, Vidyaranyapura Sub Division, BBMP, Bangalore.
Reference	AEE/BBMP/VSD/PR/643/2014-15 Dated: 09.02.2015
Source / Location	Hot Mix Plant, Bangalore
Type of Mix	Bituminous Concrete
Date of Testing	10.02.2015

Sl No.	Details	Trial No.		Average
		1	2	
1	Total weight of aggregate sample filling the cylindrical measure = W_1 g	381	384	
2	Weight of agregate passing 2.36 mm sieve after the test = W_2 g	82	84	
3	Weight of aggregate retained 2.36 mm sieve after the test = W_3 g	299	300	
4	Aggregate Impact value = percent fines 100* (W_2/W_1) percent	21.52	21.88	**21.70**

Comments:

→ Maximum allowable Aggregate Impact value for Bituminous Concrete is 24%

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Job No.: CTCE/BBMP/WNo.09/BHS/BC/AIV/2014-15 10.02.2015

Aggregate Impact Value

IS: 2386 Part IV

Client	**Asst. Executive Engineer,** Vidyaranyapura Sub Division, BBMP, Bangalore.
Agency	**Mr. B.H. Shivakumar,** Contractor, Bangalore.
Name of the Work	Improvements of Nanjappa Circle in Ward No. 09, Vidyaranyapura Sub Division, BBMP, Bangalore.
Reference	AEE/BBMP/VSD/PR/643/2014-15 Dated: 09.02.2015
Source / Location	Hot Mix Plant, Bangalore
Type of Mix	Bituminous Concrete
Date of Testing	10.02.2015

Sl No.	Details	Trial No.		Average
		1	2	
1	Total weight of aggregate sample filling the cylindrical measure = W_1 g	380	384	
2	Weight of agregate passing 2.36 mm sieve after the test = W_2 g	82	84	
3	Weight of aggregate retained 2.36 mm sieve after the test = W_3 g	298	300	
4	Aggregate Impact value = percent fines 100* (W_2/W_1) percent	21.58	21.88	21.73

Comments:

→ Maximum allowable Aggregate Impact value for Bituminous Concrete is 24%

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Aggregate Impact Value

IS: 2386 Part IV

Client	**Asst. Executive Engineer,** Vidyaranyapura Sub Division, BBMP, Bangalore.
Agency	**Mr. B.H. Shivakumar,** Contractor, Bangalore.
Name of the Work	Improvements of Nanjappa Circle in Ward No. 09, Vidyaranyapura Sub Division, BBMP, Bangalore.
Reference	AEE/BBMP/VSD/PR/643/2014-15 Dated: 09.02.2015
Source / Location	Hot Mix Plant, Bangalore
Type of Mix	Bituminous Concrete
Date of Testing	10.02.2015

Sl No.	Details	Trial No.		Average
		1	2	
1	Total weight of aggregate sample filling the cylindrical measure = W_1 g	381	385	
2	Weight of agregate passing 2.36 mm sieve after the test = W_2 g	82	84	
3	Weight of aggregate retained 2.36 mm sieve after the test = W_3 g	299	301	
4	Aggregate Impact value = percent fines 100* (W_2/W_1) percent	21.52	21.82	**21.67**

Comments:

→ Maximum allowable Aggregate Impact value for Bituminous Concrete is 24%

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Job No.: CTCE/BBMP/WNo.09/BHS/BC/Shape.T/2014-15 : 10.02.2015

DETERMINATION OF FLAKINESS INDEX & ELONGATION INDEX OF COARSE AGGREGATES

Client	: **Asst. Executive Engineer,** Vidyaranyapura Sub Division, BBMP, Bangalore.
Agency	: **Mr. B.H. Shivakumar,** Contractor, Bangalore.
Name of Work	: Improvements of Nanjappa Circle in Ward No. 09, Vidyaranyapura Sub Division, BBMP, Bangalore.
Reference	: AEE/BBMP/VSD/PR/643/2014-15 Dated: 09.02.2015
Technical Reference	: IS 2386(Part 1) 1963 (RA 2007)
Type of Mix	: Bituminous Concrete
Date of Testing	: 10.02.2015

Result : Flakiness Index = **11.29%**

Elongation Index = **13.42%**

Result : Combined Flakiness & Elongation index **24.71%**

Comments:

→ Maximum allowable Flakiness & Elongation Index for Bituminous Concrete is 30%

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Job No.: CTCE/BBMP/WNo.09/BHS/BC/Shape.T/2014-15 : 10.02.2015

DETERMINATION OF FLAKINESS INDEX & ELONGATION INDEX OF COARSE AGGREGATES

Client	: **Asst. Executive Engineer,** Vidyaranyapura Sub Division, BBMP, Bangalore.
Agency	: **Mr. B.H. Shivakumar,** Contractor, Bangalore.
Name of Work	: Improvements of Nanjappa Circle in Ward No. 09, Vidyaranyapura Sub Division, BBMP, Bangalore.
Reference	: AEE/BBMP/VSD/PR/643/2014-15 Dated: 09.02.2015
Technical Reference	: IS 2386(Part 1) 1963 (RA 2007)
Type of Mix	: Bituminous Concrete
Date of Testing	: 10.02.2015

Result : Flakiness Index = **11.57%**

Elongation Index = **13.49%**

Result : Combined Flakiness & Elongation index **25.06%**

Comments:

→ Maximum allowable Flakiness & Elongation Index for Bituminous Concrete is 30%

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DETERMINATION OF FLAKINESS INDEX & ELONGATION INDEX OF COARSE AGGREGATES

Client	: **Asst. Executive Engineer,** Vidyaranyapura Sub Division, BBMP, Bangalore.
Agency	: **Mr. B.H. Shivakumar,** Contractor, Bangalore.
Name of Work	: Improvements of Nanjappa Circle in Ward No. 09, Vidyaranyapura Sub Division, BBMP, Bangalore.
Reference	: AEE/BBMP/VSD/PR/643/2014-15 Dated: 09.02.2015
Technical Reference	: IS 2386(Part 1) 1963 (RA 2007)
Type of Mix	: Bituminous Concrete
Date of Testing	: 10.02.2015

Result : Flakiness Index = **11.58%**

Elongation Index = **13.83%**

Result : Combined Flakiness & Elongation index **25.41%**

Comments:

→ Maximum allowable Flakiness & Elongation Index for Bituminous Concrete is 30%

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Job No.: CTCE/BBMP/WNo.09/BHS/BC/Stripping/2014-15 12.02.2015

Stripping Value of Road Aggregates (Static Immersion Test)

IS: 6241

Client	**Asst. Executive Engineer,** Vidyaranyapura Sub Division, BBMP, Bangalore.
Agency	**Mr. B.H. Shivakumar,** Contractor, Bangalore.
Name of the Work	Improvements of Nanjappa Circle in Ward No. 09, Vidyaranyapura Sub Division, BBMP, Bangalore.
Reference	AEE/BBMP/VSD/PR/643/2014-15 Dated: 09.02.2015
Type of Mix	Bituminous Concrete
Date of Testing	12.02.2015

Type of binder : 80/100
Percentage of binder used : 5.00% by wt.
Total weight of aggregate : 200 g
Total weight of binder : 10.00 g
Temperature of water-bath : 40° C

Observation Number	Stripping, Percentage	Average, Percentage	Average Retained Coating, %
1	2.8	2.97	97.03
2	3.0		
3	3.1		

Comments:

→ Minimum allowable Aggregate retained coating for Bituminous Concrete is 95%

Note:

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Job No.: CTCE/BBMP/WNo.09/BHS/BC/Sp_Wa/2014-15 12.02.2015

Specific Gravity And Water Absorption Test

IS: 2386 Part III

Client	**Asst. Executive Engineer,** Vidyaranyapura Sub Division, BBMP, Bangalore.
Agency	**Mr. B.H. Shivakumar,** Contractor, Bangalore.
Name of the Work	Improvements of Nanjappa Circle in Ward No. 09, Vidyaranyapura Sub Division, BBMP, Bangalore.
Reference	AEE/BBMP/VSD/PR/643/2014-15 Dated: 09.02.2015
Type of Mix	Bituminous Concrete
Date of Testing	12.02.2015

Sl. No.	Details	Notation	Test Number			Mean Value
			Test 1	Test 2	Test 3	
1	Weight of aggregate suspended in water with the basket	W_1 g	2025	1959	1997	
2	Weight of basket suspended in water	W_2 g	755	755	755	
3	Weight of saturated aggregate in water	$(W_1 - W_2) = W_s$ g	1270	1204	1242	
4	Weight of saturated surface dry aggregate in air	W_3 g	2032	2008	2009	
5	Weight of water equal to the volume of the aggregate	$(W_3 - W_S)$ g	762	804	767	
6	Weight of oven dried aggregate	W_4 g	2015	1994	1996	
7	Specific Gravity	$W_4/(W_3-W_S)$	2.644	2.480	2.602	2.576
8	Apparent Specific gravity	$W_4/(W_4-W_S)$	2.705	2.524	2.647	2.625
9	Water Absorption	$((W_3-W_4)*100)/W_4$	0.84%	0.70%	0.65%	0.73%

Comments:

→ Maximum allowable Aggregate Water absorption value for Bituminous Concrete is 2.0%

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Job No.: CTCE/BBMP/WNo.09/BHS/BC/Agg/2014-15 12.02.2015

Aggregate Gradation Test

IS : 2386 Part I

Client	**Asst. Executive Engineer,** Vidyaranyapura Sub Division, BBMP, Bangalore.
Agency	**Mr. B.H. Shivakumar,** Contractor, Bangalore.
Name of the Work	Improvements of Nanjappa Circle in Ward No. 09, Vidyaranyapura Sub Division, BBMP, Bangalore.
Reference	AEE/BBMP/VSD/PR/643/2014-15 Dated: 09.02.2015
Sample I / D	Hot Mix Plant, Bangalore
Type of Mix	Bituminous Concrete
Date of Testing	12.02.2015

Total Weight of Sample: **5475** gm

SIEVE SIZE, mm	Weight Retained, gm	% Retained	Cummulative % Retained	% Passing	JOBMIX Gradation as per MORTH	Remarks
19	0	0	0	100	100	Gradation satisfies Bituminous concrete Grade-II specification as per MORTH
13.2	592	10.81	10.81	89.19	79 - 100	
9.5	612	11.18	21.99	78.01	70 - 88	
4.75	715	13.06	35.05	64.95	53 - 71	
2.36	633	11.56	46.61	53.39	42 - 58	
1.18	754	13.77	60.38	39.62	34 - 48	
0.600	615	11.23	71.62	28.38	26 - 38	
0.300	443	8.09	79.71	20.29	18 - 28	
0.150	342	6.25	85.95	14.05	12 - 20	
0.075	398	7.27	93.22	6.78	4 - 10	

Total Weight of Sample: **4825** gm

SIEVE SIZE, mm	Weight Retained, gm	% Retained	Cummulative % Retained	% Passing	JOBMIX Gradation as per MORTH	Remarks
19	0	0	0	100	100	Gradation satisfies Bituminous concrete Grade-II specification as per MORTH
13.2	674	13.97	13.97	86.03	79 - 100	
9.5	469	9.72	23.69	76.31	70 - 88	
4.75	637	13.20	36.89	63.11	53 - 71	
2.36	513	10.63	47.52	52.48	42 - 58	
1.18	645	13.37	60.89	39.11	34 - 48	
0.600	516	10.69	71.59	28.41	26 - 38	
0.300	405	8.39	79.98	20.02	18 - 28	
0.150	328	6.80	86.78	13.22	12 - 20	
0.075	315	6.53	93.31	6.69	4 - 10	

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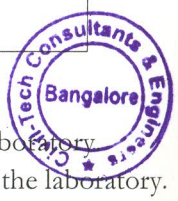
Job No.: CTCE/BBMP/W.No.93/VSR /BC/Stability/2014-15 12.02.2015

TEST REPORT ON STABILITY OF MIX

Client	:	**Asst. Executive Engineer,** Vidyaranyapura Sub Division, BBMP, Bangalore.
Agency	:	**Mr. B.H. Shivakumar,** Contractor, Bangalore.
Name of the Work	:	Improvements of Nanjappa Circle in Ward No. 09, Vidyaranyapura Sub Division, BBMP, Bangalore.
Reference		AEE/BBMP/VSD/PR/643/2014-15 Dated: 09.02.2015
Source of location	:	Hot mix Plant, Bangalore
Type of Mix	:	Bituminous Concrete
Date of Testing	:	12.02.2015

The results of the tests conducted on the Bituminous Concrete mix sample are as follows:

Sl. No	Description	Test Result 1	Test Result 2	Requirement as per MORTH (Table 500-19)
1	Marshal Stability, Kn	10.10	9.65	9 Kn (min)
2	Marshal flow, mm	2.25	3.55	2 – 4
3	Percent air voids in Mineral Aggregate	14.20	13.30	13 – 15
4	Voids in Compacted Mix	5.15	4.75	3 – 6
5	Percent Voids filled with Bitumen	68.90	69.40	65 - 75
6	Density, g/cc	2.26	2.27	--



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